

Clinical Profile of Diabetic Patients with its Chronic Complications: Hospital Based Observational Study

Kolamkar Yogesh¹, Lakhani Krishna², Panjwani Madhu³, Hadiyel Ila⁴

²Professor (Additional) and Incharge Head, Department of General Medicine, Sir Takhatsinhji Hospital and Govt. Medical College, Bhavnagar

Abstract: *Diabetes mellitus (DM) have various associated metabolic morbidities sharing phenotype of hyperglycemia. Complication that occurs as result of diabetes affects many organ systems and responsible for majority of morbidity and mortality. Furthermore, problem get worsened as the diagnosis of diabetes is often delayed from months to years due to lack of symptoms, lack of awareness and the fear of unknown in spite of awareness. Research aim's to study the clinical profile of diabetic patients with its chronic complications, hence study was conducted at Sir T. Hospital, Government Medical College, Bhavnagar over a period of 8 months where 300 patients was screened for diabetic complications, hypertension, dyslipidemia, and body mass index. Standard protocols were used to make the diagnosis of retinopathy, neuropathy and nephropathy. Out of 300 newly detected diabetics, 180 men and 120 women patients were studied. Research revealed that 65% of the patients presented with peripheral and autonomic neuropathy; 26% of the patients presented with retinopathy; 32% of the patients had nephropathy. 49% had Hyperlipidemia (hypercholesterolemia – 29%, hypertriglyceridemia - 49%, decreased HDL- 11% and increased LDL-35%). As duration of diabetes increases, there is increase in the risk of chronic complications and severity of disease.. This study enumerates the various clinical presentations of chronic complications in which some complications are reversible so early detection and proper treatment can avoid worst outcome (chronic complications) of the disease by early intervention.*

Keywords: Retinopathy, Neuropathy, Nephropathy

1. Introduction

Diabetes mellitus (DM) refers to group of common metabolic disorders that shares the phenotype of hyperglycemia. Several other types of DM are caused by interactions of genetics and environmental factors. Depending on etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization and increased glucose production. The metabolic dys-regulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system (Longo DL et al., 2015).

The worldwide prevalence of DM has risen dramatically over the past two decades from an estimated 30 million cases in 1985 to 382 million in 2013. Based on current trends, the international diabetes federation projects projected that 592 million individuals will have diabetes by the year 2035. Type 2 diabetes mellitus (T2DM) is the most common form of diabetes constituting 90% of the diabetic population. The countries with the greatest number of individuals with diabetes in 2013 are China (98.4 million), India (65.1 million), United States (24.4 million), Brazil (11.9 million), and Russian Federation (10.9 million). Until recently, India had more diabetics than any other country in the world, according to the International Diabetes Foundation, although the country has now been surpassed in the top spot by China. There were 69.1 million cases of diabetes in India in 2015. The international diabetes federation projects that an estimated 101 million will have diabetes in India in 2030. The average age on onset is 42.5 years. Nearly 1 million Indians die due to diabetes every year (Longo DL et al., 2015).

In addition to this the so called “Asian Indian phenotype” refers to certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance, higher waist circumference, central obesity despite lower body mass index (BMI), lower adiponectin and higher levels of highly sensitive C-reactive protein levels. This phenotype makes Asians more prone to diabetes and premature coronary artery disease. In large metropolitan cities in India (Mumbai, Delhi, Calcutta, Chennai, Bangalore, and Hyderabad), the prevalence of diabetes among adults (aged ≥ 20 years) ranges from 8-18%. The prevalence of type 2 diabetes mellitus is 3-9% in rural areas (Longo DL et al., 2015).

Diabetes mellitus is characterized by asymptomatic phase between actual onset of hyperglycemia and clinical diagnosis which has been estimated to last at least 4-7 years (Harris MI et al. 1992). Diabetes related complications affect many organ systems and are responsible for majority of morbidity and mortality associated with the disease. Diabetes related complication usually do not appear until the second decade of hyperglycemia. The problem is further worsened as the diagnosis of diabetes is often delayed from months to years due to lack of symptoms, lack of awareness and the fear of unknown in spite of awareness. Fortunately, many of the diabetes related complications can be prevented or delayed with early detection, aggressive glycemic control, and efforts to minimize the risks of complications. Diabetes related complications divided into vascular and non-vascular and are similar for Type 1 and Type 2 DM. Microvascular complications are diabetic specific, whereas Macrovascular complications are similar to those in non-diabetics but occurred at a greater frequency in individuals with diabetes. Our study is an attempt to provide data on diabetes that will guide health care professionals in managing the disease appropriately.

Criteria for the Diagnosis of Diabetes Mellitus

Symptoms of diabetes with random blood glucose concentration ≥ 11.1 mmol/L (200 mg/dL) or Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dL) or Hemoglobin A1c $\geq 6.5\%$ or 2 hours plasma glucose ≥ 11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test.

Random is defined as without regard to time since the last meal.

Fasting is defined as no caloric intake for at least 8 h.

Hemoglobin A1c test should be performed in a laboratory using a method approved by the National Glycohemoglobin Standardization. (ADA, 2014)

Complications of Diabetes

Acute Complications

- Diabetes Ketoacidosis
- Hyperosmolar Non Ketotic Coma
- Hypoglycemia

Chronic Complications

Macrovascular

- Coronary heart disease
- Peripheral arterial disease
- Cerebrovascular disease

Microvascular

Eye disease

- Retinopathy (nonproliferative/ proliferative)
- Macular edema

Neuropathy

- Sensory and motor (mono- and polyneuropathy)
- Autonomic

Nephropathy (albuminuria and declining renal function)

- Periodontal disease
- Hearing loss
- Other comorbid conditions associated with diabetes (relationship to hyperglycemia is uncertain): depression, obstructive sleep apnea, fatty liver disease, hip fracture, osteoporosis (in type 1 diabetes), cognitive impairment or dementia, low testosterone in men.

Retinopathy

Diabetes results in characteristic lesions in the retinal blood vessels. This can result in formation of microaneurysms, haemorrhages and increased leakage, causing retinal edema and lipid exudates. These changes are defined as background retinopathy (NPDR). They do not threaten visual acuity unless they are located in the macular region, where they can cause macular edema. Capillary closure can lead to areas of impaired perfusion and ischaemia, which can result in retinal infarcts and formation of new vessels, defined as proliferative retinopathy (PDR). The appearance of neovascularization in response to retinal hypoxemia is the hallmark of proliferative diabetic retinopathy. New vessels

can cause intraocular bleeding and impair vision. The formation of fibrous tissue may eventually cause retinal detachment and severe visual impairment (Forrester et al., 1997).

Nephropathy

The hallmark of renal damage in diabetes is increased excretion of proteins, mainly albumin, in the urine. The natural history of diabetic nephropathy has been viewed as a descending path from normoalbuminuria to microalbuminuria and overt proteinuria and eventually to end-stage renal disease (ESRD). The American Diabetes Association (ADA) recently suggested that the terms previously used to refer to increased urinary protein (microalbuminuria as defined as 30–299 mg/d in a 24-h collection or 30–299 $\mu\text{g}/\text{mg}$ creatinine in a spot collection or macroalbuminuria as defined as >300 mg/24 h) be replaced by the phrases “persistent albuminuria (30–299 mg/24 h)” and “persistent albuminuria (≥ 300 mg/24 h)” to better reflect the continuous nature of albumin excretion in the urine as risk factor for nephropathy and cardiovascular disease (CVD). Although the appearance of microalbuminuria in type 1 DM is an important risk factor for progression to macroalbuminuria, only ~50% of individuals progress to macroalbuminuria over the next 10 years. In some individuals with type 1 diabetes and microalbuminuria of short duration, the microalbuminuria regresses. Microalbuminuria is also a risk factor for CVD. (Melmed, S et al, 2016)

Neuropathy

The most common form of diabetic neuropathy is distal symmetric polyneuropathy. It most frequently presents with distal sensory loss and pain, but up to 50% of patients do not have symptoms of neuropathy. Hyperesthesia, paresthesia, and dysesthesia may occur. Any combination of these symptoms may develop as neuropathy progresses. Neuropathic pain develops in some of these individuals, occasionally preceded by improvement in their glycemic control. As diabetic neuropathy progresses, the pain subsides and eventually disappears, but a sensory deficit in the lower extremities persists. Physical examination reveals sensory loss, loss of ankle deep-tendon reflexes, and abnormal position sense.

Diabetic polyradiculopathy is a syndrome characterized by severe disabling pain in the distribution of one or more nerve roots. It may be accompanied by motor weakness. Intercostal or truncal radiculopathy causes pain over the thorax or abdomen. Involvement of the lumbar plexus or femoral nerve may cause severe pain in the thigh or hip and may be associated with muscle weakness in the hip flexors or extensors (diabetic amyotrophy). Fortunately, diabetic polyradiculopathies are usually self-limited and resolve over 6–12 months.

Mononeuropathy (dysfunction of isolated cranial or peripheral nerves) is less common than polyneuropathy in DM and presents with pain and motor weakness in the distribution of a single nerve.

Gastrointestinal/ Genitourinary Dysfunction

Long-standing type 1 and 2 DM may affect the motility and function of the gastrointestinal (GI) and genitourinary systems. The most prominent GI symptoms are delayed gastric emptying (gastroparesis) and altered small- and large-bowel motility (constipation or diarrhea). Gastroparesis may present with symptoms of anorexia, nausea, vomiting, early satiety, and abdominal bloating.

Cardiovascular Disease

The clinical manifestations of CVD include coronary heart disease (CHD), cerebrovascular disease and peripheral vascular disease (PVD). The underlying disease mechanism is accelerated atherothrombosis. The atherosclerotic process starts from fatty streaks, consisting of intimal deposits of lipids and macrophages with lipid droplets (foam cells), gradually developing into more advanced plaques. The process ends up in a complicated atherosclerotic lesion, which through a plaque rupture and thrombosis can cause an acute myocardial infarction.

Atherosclerotic lesions in diabetic patients are histologically similar to those in non-diabetic subjects, but appear to be more extensive and severe than in non-diabetic subjects. This is illustrated by a Finnish 7-year follow-up study in which patients with type 2 diabetes without prior myocardial infarction had a risk of infarction similar to that among non-diabetic men with a previous infarction. The prevalence of CVD is highly dependent upon which methods are used to detect the disease. CHD, the most important manifestation of CVD, represents a wide spectrum from angina pectoris, myocardial infarction and sudden death to silent myocardial ischaemia (Naka et al., 1992). Silent myocardial ischaemia has a reported prevalence of 10-20 % in diabetic populations compared with 1-4 % in non-diabetic populations (Janand-Delenne et al., 1999). The atherosclerotic process can be studied non-invasively by the use of imaging techniques such as measuring the intima-media thickness by ultrasound, and magnetic resonance imaging. Measurement of ankle-brachial index (ABI) has also been used to detect asymptomatic atherosclerosis.

2. Aims & Objectives

Aim

To study the clinical profile of diabetic patients having chronic complications.

Objectives

- To study the different chronic complications of diabetes among the patients.
- To investigate on various epidemiological factors associated with chronic diabetic complications.
- To evaluate the risk of chronic complications with duration of diabetes.
- To study correlation of chronic complications with glycemic control (HbA1c).

3. Methodology

A hospital based survey and investigation was conducted for nine months from December 2016 till August 2017. The

patient diagnosed with diabetes mellitus in the hospital was closely monitored. Diagnosis was done as per ADA guideline formulated by department of medicine, Sir Takhatsinhji Hospital, Bhavangar. Both outdoor and indoor patients participated in the study. Over the period of 9 months about 300 patient samples were collected and records were investigated.

Inclusion criteria

- Patient with age 18 years and above gave verbal as well as written consent was included in the study, whereas patient age 12 years above the consent was obtained from their parents.

Exclusion criteria

- Patients not willing to be a part of study.
- Patients with acute complications of diabetes.
- Patients with age \leq 12 years.
- Primary retinal diseases
- Renal diseases
- Patients with gestational diabetics, and steroid-induced diabetics or those with co-morbid conditions that require prolonged steroid therapy were excluded.
- Other diseases causing peripheral neuropathy

Method of Collection of Data

Clinical history and Patients examination.

After written consent, all patients were subjected to detailed history and thorough clinical examination. Confirm diagnosis of DM made on basis of ADA Guidelines. Diagnosis of neuropathy was made on the basis of clinical examination for sense of touch, pain and vibration and reflexes. Non diabetic causes of neuropathy were ruled out. Combination of more than one test has $>87\%$ sensitivity in detecting diabetic polyneuropathy. The diagnosis of retinopathy was confirmed from ophthalmologic examination that included fundoscopy or retinal photography and measurement of visual acuity, performed by an ophthalmologist. They were classified into proliferative diabetic retinopathy (PDR) or non-proliferative diabetic retinopathy (NPDR) accordingly. 24 hour urinary albumin estimation was done to diagnose diabetic nephropathy. A value of >300 mg/dl was taken as confirmed nephropathy. Urinary collection for albumin estimation was done taking care of factors that interfere with proteinuria like hypertension and urinary tract infections etc.

Blood pressure was recorded twice 10 min apart in both arms in supine as well as standing position. Blood pressure was measured in the sitting position in right arm to the nearest 2 mmHg with a mercury sphygmomanometer (Diamond Deluxe BP apparatus, BP Instruments, Pune, India), and the participants were considered to be hypertensive if they were taking antihypertensive medication (as documented in clinic records) or SBP \geq 140 mmHg or DBP \geq 90 mmHg as per JNC-8 Guidelines. Diagnosis of dyslipidemia was made on the basis of fasting lipid profile. Coronary artery disease (CAD) was diagnosed on the basis of electrocardiograph (ECG) changes, and response to nitrates in case of exertional chest pain. Height and weight of patients were taken to calculate body mass index (BMI). BMI cut off value of 25 kg/m² for male and 23 kg/m² for

female was used for making diagnosis of obesity as recommended for Asian phenotype.

Anthropometric measurements including weight, height (using stadiometer), body mass index (BMI; kg/m²), and waist circumference (using inelastic and flexible tape at the midpoint between the lower margin of the least palpable rib and top of the iliac crest nearest to 0.1 cm) were carried out at the time of recruitment. Information about socioeconomic and lifestyle characteristics (smoking and alcohol consumption) was obtained through patient interview at the time of recruitment. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) levels, serum lipids, blood glucose and glycated hemoglobin (HbA1c), urinary microalbumin protein and hepatic and renal function tests were done. HbA1c was measured. Serum cholesterol (cholesterol esterase oxidaseperoxidase-amidopyrine method), serum triglycerides (glycerol phosphate oxidaseperoxidase-amidopyrine method), and high density lipoprotein cholesterol (method polyethylene-glycol-pretreated enzymes) were also evaluated.

All the data collect from the hospital were analysed using statistical software and p value was calculated as described in the result.

4. Result and Discussion

A total number of 300 cases with Diabetes Mellitus (DM), admitted to Sir T. Hospital who met the inclusion criteria were participated in research from December 2016 to August 2017 for chronic complications. Of 300 patients with DM, number of male was more as compared to the females 180 and 120 respectively. Similarly, Ramachandran et al.,(1997) and Weersuriya N et al., (1998) study have same finding where male patients were higher as compared to female patients. Males are more commonly affected than females as men may be less sensitive to insulin than women or that males tend to store fat around their organs rather than women fat is stored under the skin.

The mean age of male patients was slightly lower (49.4±8.8 years) as compared to the female (50.1±10.2 years) who were admitted with DM and chronic complications. However, similar study conducted by RP Agarwal et al (2004) shows that mean age of patients was 50.7 years whereas, Nambuya AP et al (1996) research the mean was lower than the present research (45 years) Majority of the patients (36% and 37%) were between age range 41-50 and 51-60 years in both sex as shown in the table below.

Table 1: Showing number of patients according to age and sex distribution

Age	Male	Female	Frequency (%)
30 – 40	30	18	48 (16%)
41 – 50	60	48	108 (36%)
51 – 60	75	36	111 (37%)
61 – 70	09	12	21 (07%)
71 – 80	06	06	12 (04%)
Total	180	120	300 (100%)

Table 2 illustrates that out of 300 diabetic's patients, 52% of the patients were overweight of which 28% were males and

24% were females. About 41% of them have Normal BMI (27% females and 14% males). 60% of the female patients were having high BMI Compare to male 46.66%. Mean BMI of Male and Female was statistically not significant (24.22 ± 3.00vs25.13 ± 2.32; p=0.1082).The mean BMI in the present study was 24.68± 2.89 which is lower as 27±1.78 in a study by Anand Mosses CR (1997) while it was 28.5±4.7 in the study by Cathelineau G et al (1997).From above observation increase in number of overweight or obese patients was strongly linking have risk of DM.

Table 2: BMI of Male and Female patients

Weight	Male	Female	Total (%)
Underweight	06	-	6 (02%)
Normal	90	48	118 (46%)
Overweight	84	72	176 (52%)
Total	180	120	300(100%)
Mean	24.22 ± 3.00	25.13 ± 2.32	0.1082

Mean W:H was 0.99±0.08 in the present study almost close as compared to study Anand Mosses CR et al (1997) where, it was in 0.95±0.05 and 0.99±0.1 in Cathelineau G et al (1997) study. The mean W:H was almost equal when compared to other studies. It indicates that Indians as an ethnic group have high prevalence of central obesity especially in women. The so-called “Asian Indian phenotype” refers to certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance, higher waist circumference despite lower body mass index (BMI), lower adiponectin and higher levels of highly sensitive C-reactive protein levels. This phenotype makes Asians more prone to diabetes and premature coronary artery disease.

Symptomatic peripheral neuropathy is more common than asymptomatic peripheral neuropathy. About, 65% of the patients presented with peripheral neuropathy at the time of diagnosis of diabetes. Furthermore, 29% of the patients (17% males and 12% females) were presented with only symptoms of peripheral neuropathy, 8% of them were presented with only signs of peripheral neuropathy, 28% of them (16% males and 12% females) were having both signs and symptoms presented in table 4. Peripheral neuropathy was high in this study compared to Ratzmann K P et al (1991) study which was only 6.3%.

Table 4: Showing total number of patients with peripheral neuropathy based on signs and symptoms

Peripheral neuropathy	Male	Female	Total (%)
Only symptoms	51 (17%)	36 (12%)	87 (29%)
Both signs and symptoms	48 (16%)	36 (12%)	84 (28%)
Only signs	15 (05%)	09 (03%)	24 (08%)
Total	114 (38%)	81 (27%)	195 (65%)

Table 5 illustrates patient with diabetes retinopathy. Total 24% (14% males and 12% females) of the patients had retinopathy at the time of diagnosis which is statistically non-significant. PDR is more common than NPDR as it is an observational study and patients who were selected for this study might be having Diabetes which was undetected due to lack of symptoms,lack of awareness and fear of unknown factors. Furthermore, Raman R et al(2008) and RamachandranAet al(1997) study have PDF was 23.7% and 18% respectively.

Table 5: Showing number of patient presenting with retinopathy at the time of diagnosis of diabetes mellitus

Retinopathy	Male	Female	Total (%)	P value
PDR	30	12	42 (14%)	0.1654
NPDR	21	15	36 (12%)	0.7659

From the above data it is clear that 28% of the patients presented with incipient nephropathy at the time of diagnosis. 4% of the patients had macroalbuminuria. 28% of the patients were presented with diabetic nephropathy at the time of diagnosis of diabetes mellitus. The percentage of microalbuminuria in present study was nearly equal to Cathelineau G et al (1995), was higher than Ramachandra A et al (1997) study. Microalbuminuria is more common than macroalbuminuria and it progresses as the duration of diabetes increases.

Table 6: Showing number of patients with diabetic nephropathy in patients with newly diagnosed diabetes mellitus

Proteinuria	Male	Female	Total (%)	P value
Microalbuminuria	36	48	84 (28%)	0.5410
Macroalbuminuria	6	6	12 (4%)	0.6135

Statistical analysis of above obtained data reveals that patient with HbA1c $\geq 8\%$ have 4.4 times higher risk of developing microvascular complications than patient with HbA1c $\leq 8\%$.

This indicates HbA1c is a better predictor of microvascular complications in diabetics.

Table 7: Correlation of HbA1C in relation to microvascular complications

Hb1AC	Complication	Without Complication	Total (%)
6.5-7.5	6 (28.5%)	15 (71.5%)	21 (07%)
7.6-8.5	45 (48.3%)	48 (51.6%)	93 (31%)
8.6-9.5	54 (62.1%)	33 (37.9%)	87 (29%)
9.6-10.5	54 (81.8%)	12 (18.2%)	66 (22%)
10.6-11.5	30 (90.9%)	3 (9.1%)	33 (11%)
Total	183	117	300 (100%)
Mean	10.69 \pm 3.82		

From the above data it is clear that hyperlipidemia under high risk category was varying in both males and females. Total cholesterol, HDL and LDL cholesterol levels were higher in males than females under borderline risk. 49% of the patients had hyperlipidemia. The percentage of patients with hypercholesterolemia was higher in this recent research study as compared to Weersuriya N et al (1998). The percentage of patients with hypertriglyceridemia was high in our study when compared to Weersuriya N et al (1998), and less compared to SS Murthy et al. The percentage of patients with decreased HDL was almost equal as compared to Weersuriya N et al (1998).

Table 8: Showing percentage of patients who had lipid in the high risk category at the diagnosis of diabetes

Lipids (high risk)	Male	Female	Total (%)
Hypercholesterolemia	63	24	87 (29%)
Hypertriglyceridemia	90	57	147 (49%)
Decreased HDL cholesterol	15	18	33 (11%)
Increased LDL cholesterol	69	36	105 (35%)

Table 9: Showing Blood urea and serum creatinine levels expressed in mg/dl

Blood Urea	Male	Female	Total (%)
< 20	18	30	48 (16%)
20 – 40	111	66	177 (59%)
> 40	51	24	75 (25%)
Serum creatinine			
<1	69	24	93 (31%)
1 -2	111	90	201 (67%)
>2	0	6	06 (2%)

Urea: mean \pm SD = 33.55 \pm 12.35

Creatinine mean \pm SD = 1.23 \pm 0.48

Most of the patients had normal Blood urea and Serum creatinine levels. 75 patients had urea > 40 mg/ dl. 6 patients had creatinine > 2mg/dl. From the above data it is clear that significant increase in Blood urea and Serum creatinine levels which is indicative of renal involvement is less common at diagnosis of diabetes mellitus

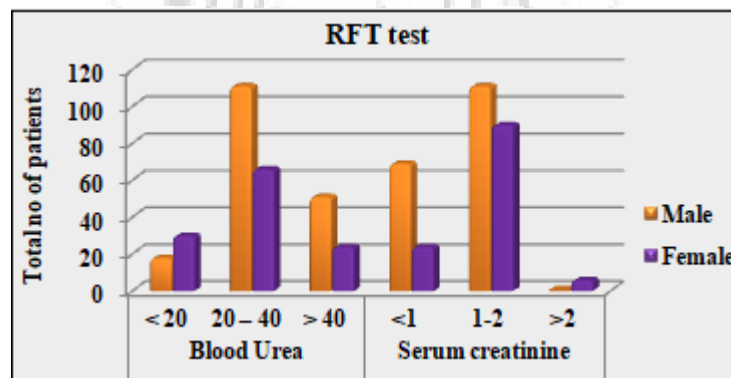


Table 10 reveals that out of 300 patients 36% patients has hypertension that too systolic hypertension is more common. Males more commonly affected (20%) as compare to female with hypertension. Coronary artery disease was present in 21% patients diagnosed on basis of electrocardiogram. Peripheral vascular disease presents 1.3%. Nearly, 5% of patients with diabetes had history of cerebro-vascular

accident. Prevalence of hypertension (36%) in our study was higher than other studies in India. Shukla et al reported 30% prevalence of hypertension in diabetic patients. Sosale et al reported 23% prevalence of hypertension. Occurrence of Coronary artery disease in this research (21%) more than Shukla et al study but less than in Sosale et al study. Nearly, 5% of patients with diabetes had history of Cerebro vascular

accident. Significant correlation between macro-vascular complications and diabetes cannot be commented as multiple modifiable/nonmodifiable risk factors like isolated hypertension, dyslipidaemia, smoking, Type A personality, sedentary lifestyle etc determine the causation of macrovascular complications.

Table 10: Showing cardiovascular involvement in form of hypertension, ECG abnormality, and peripheral artery disease

Various Morbidities	Male	Female	Total
Hypertension	60 (20%)	49 (16.3%)	109 (36%)
CHD	40 (13%)	25 (8.3%)	65 (21%)
PVD	3(1%)	1 (0.3%)	4(1.3%)
H/O TIA/ CVA	9(3%)	6(2%)	15(5%)

Table 11 describes that as duration of diabetes increases, there is increase in the risk of chronic complications and severity of disease. Out of 300 patients with history of >10 years of DM, 36 have neuropathy and retinopathy and 30 out of those 36 patients have nephropathy. Out of 21 patients who had h/o diabetes of 5 to 10 years, 20 have neuropathy, 18 have nephropathy, and all 21 have retinopathy (NPDR>PDR). Exact correlation between duration and complication of diabetes cannot be commented on the basis of cross-sectional observational study.

Table 11: Correlation of duration of Diabetes with its Microvascular Complication

Duration Of DM Complication	<5 Years (243)	≥5-10 Years (21)	≥ 10 Years (36)
Neuropathy	139	20	36
Nephropathy	48	18	30
Retinopathy	22	21	36

5. Conclusion

Neuropathy was found to be the commonest microvascular complication followed by Diabetic Nephropathy and Diabetic Retinopathy. More than 50% of the patients had microvascular complications at the time of diagnosis of Diabetes Mellitus. Furthermore, HbA1c is a better predictor of chronic complications in diabetics. However, As duration increases, there is increase in risk of chronic complications and severity of disease. The risk factors of macro vascular complication such as hypertension, overweight, and dyslipidemia were observed in 36%, 52%, and 49% of patients respectively. In addition, ischemic heart disease (Coronary Artery Disease) was noticed in 21% of patients and is more common than CVA and PVD. This study also enumerates the various clinical presentations of chronic complications in which Some complications are reversible so early detection and proper treatment can avoid worst outcome (chronic complications) of the disease by early intervention.

6. Acknowledgement

I humbly express my gratitude towards my respected guide **Dr. Madhu T. Panjwani**, Associate Professor, Department of Medicine, Govt. Medical College and Sir T. General Hospital, Bhavnagar and Additional Professor & Incharge Head of Department, **Dr. Krishna K. Lakhani** under whom

it has been privilege to work. I am sincerely thankful to **Dr. C.B. Tripathi**, Dean, Government Medical College Bhavnagar, **Dr. HemantB. Mehta**, Additional dean , Govment Medical College Bhavnagar, and **Dr. Vikas Sinha**, Medical Superintendent, Sir Takhtasinhji General Hospital, Bhavnagar for providing facility at the institute to do this dissertation work. I am thankful to my Associate Professors of Department of Medicine , **Dr. Sunil J. Panjwani**, **Dr. Alpesh R.Vora** , **Dr. Panna K. Kamdar**, **Dr. Ila N. Hadiyal** & **Dr. Hirva Munshi** who at times have provided me with many valuable tips and suggestions.

On a special note, I would like to thank **Dr Sonal Misra 2nd year medicine resident doctor**, and to all **my seniors** and **my colleagues** for their help, understanding, enthusiasm and encouragement. I am also thankful to **my juniors**. Lastly I would like to extend my special and deepest thanks to all my **patients** and **their relatives** without whom this study would not have been possible.

References

- [1] Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson J, Loscalzo J (2015). Harrison's Principles of Internal Medicine 18e. New York, NY: McGraw-Hill
- [2] Melmed, S., Polonsky, K. S., Larsen, P. R., & Kronenberg, H. (2016). Williams textbook of endocrinology (13th edition.). Philadelphia, PA: Elsevier.
- [3] Nathan, D. M., & (2014). Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications Study at 30 Years: Overview. *Diabetes Care*, 37(1), 9–16. <http://doi.org/10.2337/dc13-2112>
- [4] Agrawal RP, Ranka M, Beniwal R, Sharma S, Purohit VP, Kochar DK, Kothari RP. Prevalence of micro and macro vascular complications in type 2 diabetes and their riskfactors. *Age*. 2004;50:12-4.
- [5] Alberti KGMM, Zimmet PZ for the WHO Consultation: Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: Diagnosis and classification of diabetes mellitus, provisional report of a WHO consultation. *Diabet Med* 15:539-553, 1998.
- [6] Anand Mosses CR. Stress Ecg in newly diagnosed male NIDDM subjects. *RSSDI*, 1997Dec:17
- [7] Austin MA, Breslow JL, Hennekens CH, Buring JE, Willett WC, Krauss RM: Low-density lipoprotein subclass patterns and risk of myocardial infarction. *JAMA* 260: 1917-1921, 1988
- [8] Borch-Johnsen K, Feldt-Rasmussen B, Strandgaard S, Schroll M, Jensen JS: Urinary albumin excretion: an independent predictor of ischemic heart disease. *ArteriosclerThrombVascBiol* 19: 1992 – 1997, 1999
- [9] Cathelineau G. Management of newly diagnosed NIDDM in the primary setting effect of 2 years of gliclazide treatment. The Diadem study, *Metabolism*, 1997 Dec; 46(12):31-4.
- [10] Diabetes Control and Complications Trial Research Group: The effect of intensive treatment of diabetes on the development and progression of long term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329: 977-986, 1993

- [11] Diabetes Control and Complications Trial Research Group: Early worsening of diabetic retinopathy in the Diabetes Control and Complications Trial. *Arch Ophthalmol* 116: 874-886, 1998
- [12] Groop L, Ekstrand A, Forsblom C, Widén E, Groop PH, Teppo AM, Eriksson J: Insulin resistance, hypertension and microalbuminuria in patients with type 2 (non-insulin-dependent) diabetes mellitus. *Diabetologia* 36: 642-647, 1993
- [13] Harris MI, Klein R, Welborn TA, onset of NIDDM occurs atleast 4-7 years before clinical diagnosis. *Diabetes care* 1992; 15: 815-819.
- [14] Kannel WB, McGee DL: Diabetes and cardiovascular risk factors: The Framingham Study. *Circulation* 1: 8-13, 1979
- [15] King H, Rewers M, WHO Ad Hoc Diabetes Reporting Group. Global estimates for the prevalence of diabetes mellitus and IGT in adults. *Diabetes Care* 16: 157-177, 1993
- [16] Microalbuminuria Collaborative Study Group: Risk factors for development of microalbuminuria in insulin dependent diabetic patients: a cohort study. *Br Med J* 306: 1235-1239, 1993
- [17] Nambuya AP. The presentation of newly diagnosed diabetic patients in Uganda *QJM*, 1996 Sept; 89(9): 705-11
- [18] Niskanen LK, Tuomi T, Karjalainen J, Groop LC, Uusitupa MI: GAD antibodies in NIDDM: ten-year follow-up from the diagnosis. *Diabetes Care* 18: 1557-1565, 1995
- [19] Page RCL, Hattersley AT, Levy JC, Barrow B, Patel P, Lo D, Wainscoat JS, Permutt MA, Bell GI, Turner RC: Clinical characteristics of subjects with a missense mutation in glucokinase. *Diabetic medicine* 12: 209-217, 1995
- [20] Partanen J, Niskanen L, Lehtinen J, Mervaala E, Siitonen O, Uusitupa M (1995) Natural history of peripheral neuropathy in patients with non-insulin-dependent diabetes mellitus. *N Engl J Med* 333: 89-94, 1995
- [21] Parving H-H, Gall MA, Skött P, Jörgensen HE, Lökkegaard H, Jörgensen F, Nielsen B, Larsen S: Prevalence and causes of albuminuria in non-insulin-dependent diabetic patients. *Kidney Int* 41: 758-762, 1992
- [22] Paulsen PL. Epidemiology of microalbuminuria in diabetes and in background Population. *Current opinion-Nephrology Hypertension*, 1994; May; 3(3):248-256.
- [23] Pirart J: Diabetes mellitus and its degenerative complications: a prospective study of 4400 patients observed between 1947 and 1973. *Diabetes Care* 3: 168-188, 1978
- [24] Ramachandran A, Vishwanathan V. Prevalence of complications at diagnosis of NIDDM. *RSSDI*, 1997; Dec 14.
- [25] Rajiv Raman, Padmaja Kumari Ram, Sudhir Reddy, Rachepalle, Perumal Gnanamoorthy, Satagopan Uttre, et al. Shankar Nethralya Diabetic Retinopathy epidemiology and molecule Genetic study, 2008.
- [26] Reaven GM: Role of insulin resistance in human disease. *Diabetes* 37:1595-1607, 1988
- [27] Reema M, Deepa R, Mohan V. Prevalence of retinopathy at diagnosis among Type 2 DM patients attending diabetic centre in south India. *Br J Ophthalmol* 2000; 84: 1058-1060.
- [28] Sands ML, Shetterly SM, Franklin GM, Hamman RF: Incidence of distal symmetric (sensory) neuropathy in NIDDM. *Diabetes Care* 20: 322-329, 1997
- [29] UK Prospective Diabetes Study Group (UKPDS). X. Urinary albumin excretion over 3 years in diet-treated type 2, (non-insulin-dependent) diabetic patients, and associations with hypertension, hyperglycemia and hypertriglyceridemia. *Diabetologia* 36: 1021-1029, 1993
- [30] UK Prospective Diabetes Study Group: Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *Br Med J* 317: 703-713, 1998
- [31] Verinoca RC. High prevalence of Diabetes Retinopathy and Nephropathy in Polynesians of Western Samoa. *Diabetes Care*, Aug 1995; vol18:8